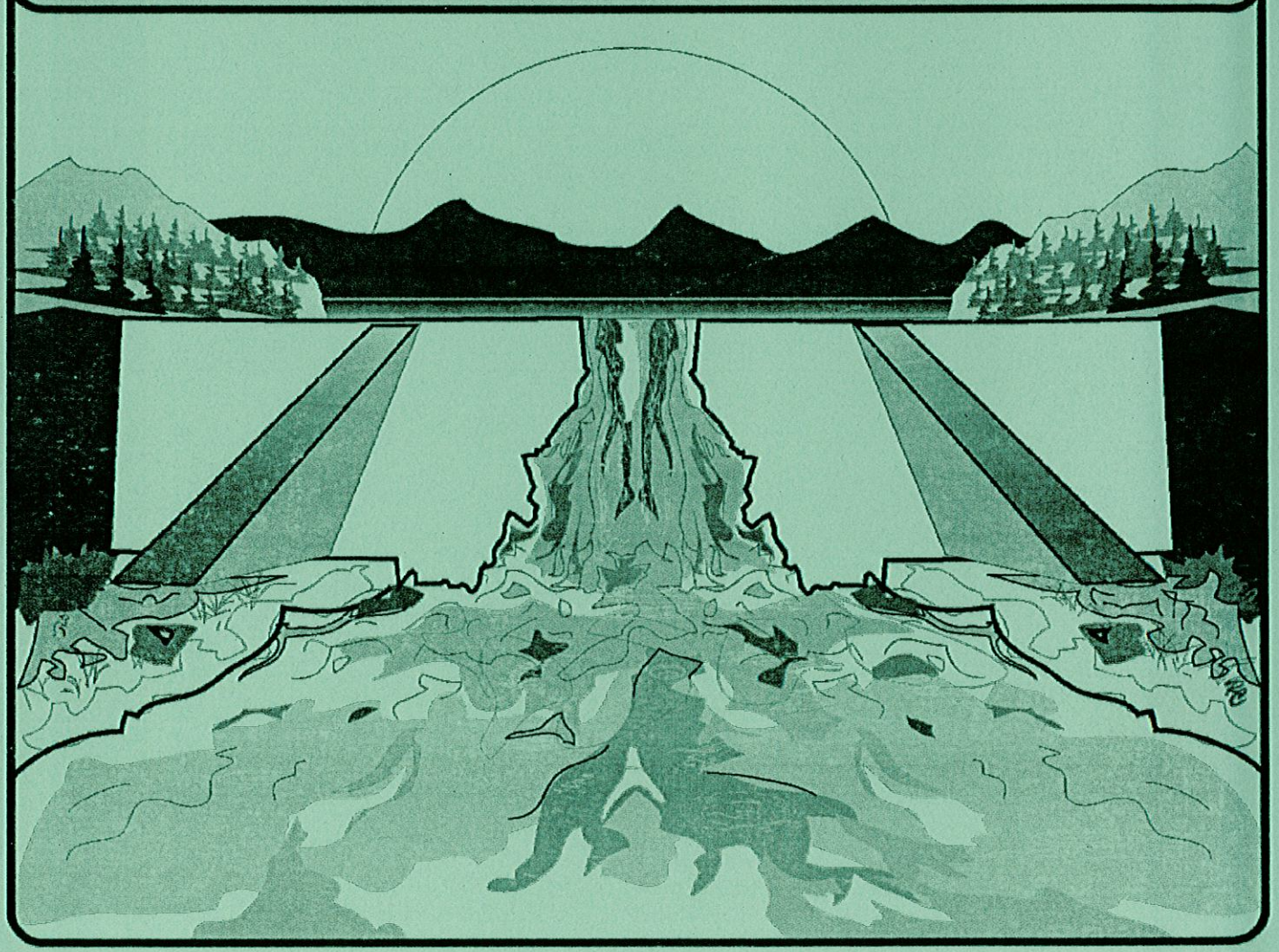
BROADWATER-MISSOURI (TOSTON) DAM

EMERGENCY ACTION PLAN



DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION

WATER RESOURCES DIVISION • STATE WATER PROJECTS BUREAU

January 2011

RED PAGES – EMERGENCIES

YELLOW PAGES – UNUSUAL OCCURRENCES

BLUE PAGES – TELEPHONE DIRECTORY

WHITE PAGES – GENERAL INFORMATION

BROADWATER-MISSOURI (TOSTON) DAM EMERGENCY ACTION PLAN

Broadwater-Missouri (Toston) Dam
FERC Project No. 2853

State Water Projects Bureau
Water Resources Division
Montana Department of Natural Resources
And Conservation
1424 9th Avenue
P. O. Box 2021601
Helena, Montana 59620-1601

Originally Published June 1991
Revised January 2011

Verification: STATE OF [ ]

County of [ ] ss:

The undersigned, being duly sworn, states that he has read the following document and knows the contents of it, and that all of the statements contained in that document are true and correct, to the best of his knowledge and belief.

Name of person signing

Chief, State Water Projects Bureau.
Title

STATE OF MONTANA)

County of Lewis & Clark

On this 19th day of January, 2011, before me, a Notary Public for the State of Montana, personally appeared Kevin Smith, known to me to be the person whose name is subscribed to the within instrument, and acknowledged to me that he executed the same.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my Notarial Seal the day and year first above written.

Kathy Arndt
Notary Public
Printed Kathy Arndt
State of Montana
Residing at Helena MT

My commission expires 9/22/2011

KATHY ARNDT
NOTARY PUBLIC for the State of Montana
Residing at Helena, Montana
My Commission Expires September 22, 2011

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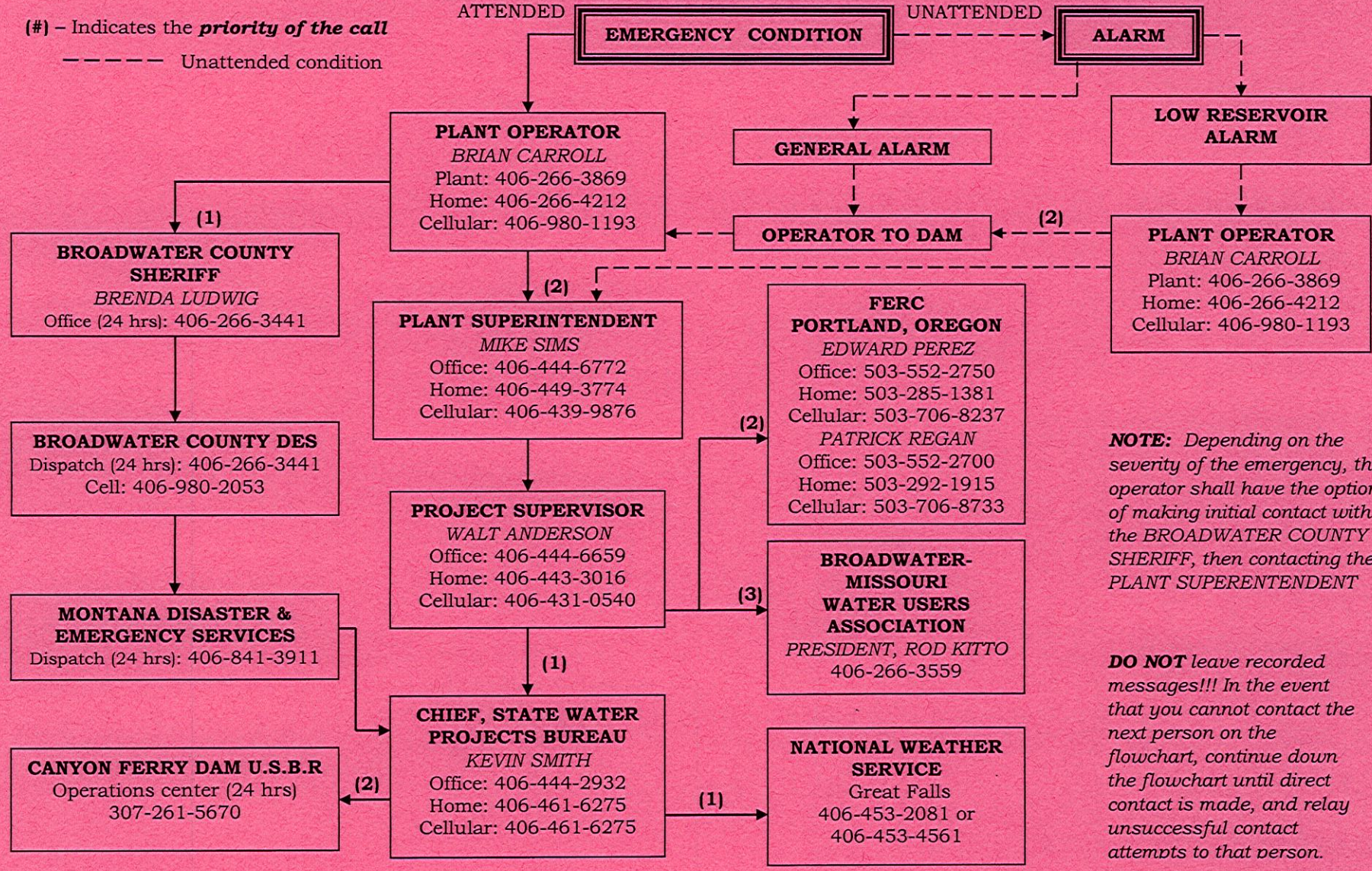
SECTION I

NOTIFICATION FLOWCHARTS

FLOWCHART A
FAILURE IS IMMINENT OR HAS OCCURRED
NOTIFICATION FLOWCHART ---- BROADWATER-MISSOURI DAM

(#) – Indicates the ***priority of the call***

– – – – – Unattended condition



NOTE: *Depending on the severity of the emergency, the operator shall have the option of making initial contact with the BROADWATER COUNTY SHERIFF, then contacting the PLANT SUPERENTENDENT*

DO NOT *leave recorded messages!!! In the event that you cannot contact the next person on the flowchart, continue down the flowchart until direct contact is made, and relay unsuccessful contact attempts to that person.*

FLOWCHART B
POTENTIAL FAILURE SITUATION IS DEVELOPING
NOTIFICATION FLOWCHART ---- BROADWATER-MISSOURI DAM

(#) – Indicates the ***priority of the call***

– – – – – Unattended condition

ATTENDED

EMERGENCY CONDITION

UNATTENDED

ALARM

PLANT OPERATOR
BRIAN CARROLL
Plant: 406-266-3869
Home: 406-266-4212
Cellular: 406-980-1193

GENERAL ALARM

LOW RESERVOIR ALARM

OPERATOR TO DAM

(2)

PLANT OPERATOR
BRIAN CARROLL
Plant: 406-266-3869
Home: 406-266-4212
Cellular: 406-980-1193

BROADWATER COUNTY SHERIFF
BRENDA LUDWIG
Office (24 hrs): 406-266-3441

(2)

(1)

PLANT SUPERINTENDENT
MIKE SIMS
Office: 406-444-6772
Home: 406-449-3774
Cellular: 406-439-9876

NATIONAL WEATHER SERVICE
(For Flood Events)
Great Falls
406-453-2081 or
406-453-4561

(3)

BROADWATER COUNTY DES
Dispatch (24 hrs): 406-266-3441
Cell: 406-980-2053

PROJECT SUPERVISOR
WALT ANDERSON
Office: 406-444-6659
Home: 406-443-3016
Cellular: 406-431-0540

FERC
PORTLAND, OREGON
EDWARD PEREZ
Office: 503-552-2750
Home: 503-285-1381
Cellular: 503-706-8237
PATRICK REGAN
Office: 503-552-2700
Home: 503-292-1915
Cellular: 503-706-8733

(4)

MONTANA DISASTER & EMERGENCY SERVICES
Dispatch (24 hrs): 406-841-3911

(1)

CHIEF, STATE WATER PROJECTS BUREAU
KEVIN SMITH
Office: 406-444-2932
Home: 406-461-6275
Cellular: 406-461-6275

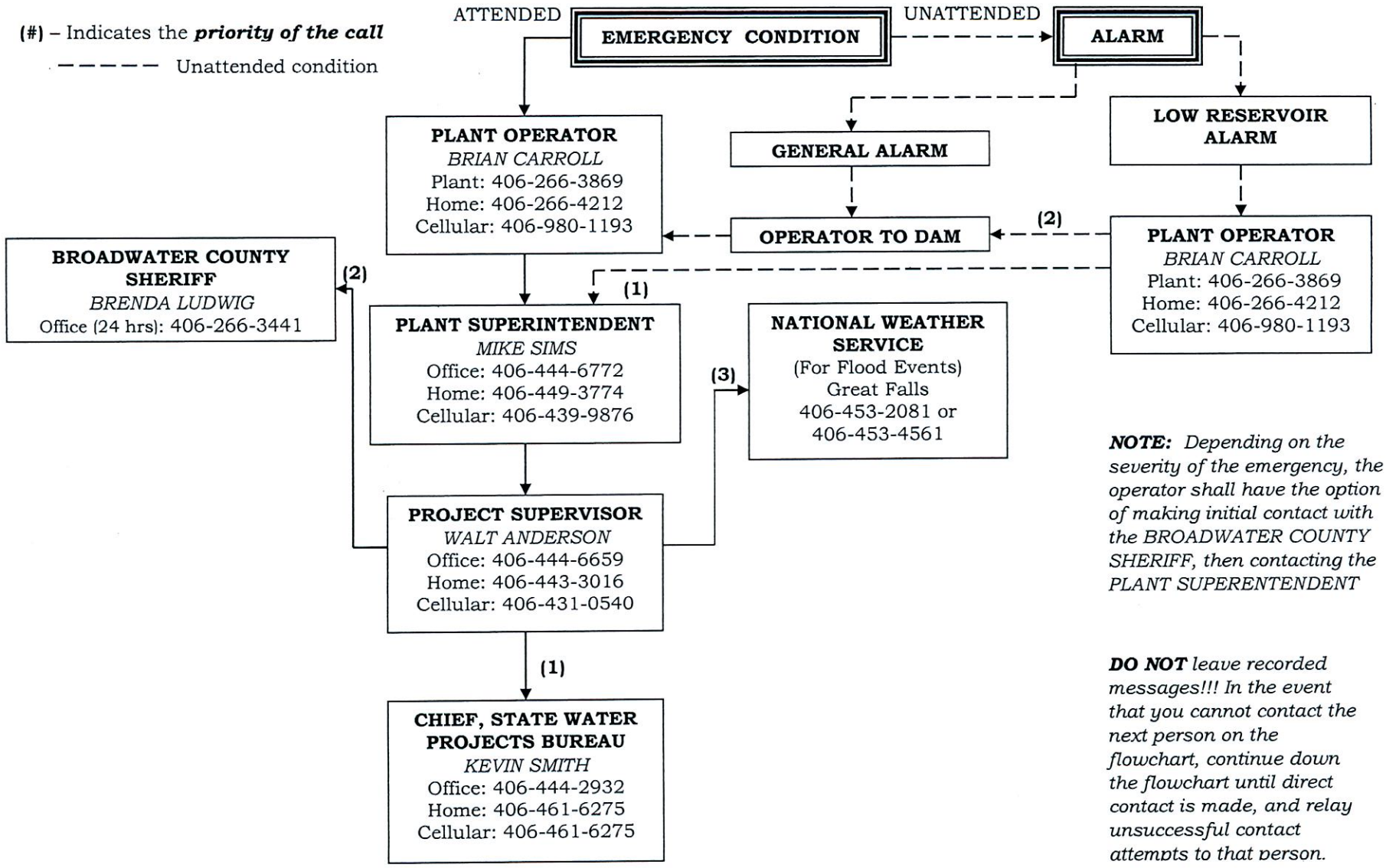
BROADWATER-MISSOURI WATER USERS ASSOCIATION
PRESIDENT, ROD KITTO
406-266-3559

(5)

NOTE: *Depending on the severity of the emergency, the operator shall have the option of making initial contact with the BROADWATER COUNTY SHERIFF, then contacting the PLANT SUPERENTENDENT*

DO NOT *leave recorded messages!!! In the event that you cannot contact the next person on the flowchart, continue down the flowchart until direct contact is made, and relay unsuccessful contact attempts to that person.*

FLOWCHART C
NON-FAILURE EMERGENCY
NOTIFICATION FLOWCHART ---- BROADWATER-MISSOURI DAM



NOTE: *Depending on the severity of the emergency, the operator shall have the option of making initial contact with the BROADWATER COUNTY SHERIFF, then contacting the PLANT SUPERENTENDENT*

DO NOT *leave recorded messages!!! In the event that you cannot contact the next person on the flowchart, continue down the flowchart until direct contact is made, and relay unsuccessful contact attempts to that person.*

II. Statement of Purpose

This Emergency Action Plan (EAP) has been prepared in accordance with the requirements of the Federal Energy Regulatory Commission, specifically Chapter 6, Emergency Action Plans from the Engineering Guidelines for the Evaluation of Hydropower Projects, dated October 2007. It is submitted by the Montana Department of Natural Resources and Conservation (DNRC), Water Resources Division, State Water Projects Bureau (SWPB), as Licensee for the Broadwater Power Project on the Missouri River, which is FERC Licensed Project No. 2853.

This plan defines responsibilities and provides procedures designed to identify unusual and unlikely conditions which may endanger the Broadwater-Missouri (Toston) Dam in time to take mitigation action and to notify the appropriate emergency management officials of possible, impending, or actual failure of the dam. The plan may also be used to provide notification when flood releases will create major flooding.

Through modeling different failure modes and the resultant breach hydrographs, inundation zones have been developed and are shown on the inundation map included in Section VII. The boundaries of the inundation zones help identify residential and recreational areas that would be at risk. Notification flowcharts were developed to facilitate evacuation and warnings at potentially affected areas by various public agencies and authorities.

The information contained in this plan is not intended to reflect in any way upon the actual integrity of the Broadwater-Missouri Dam.

III. Project Description

Broadwater-Missouri Dam is located in Broadwater County about four miles south of Toston, Montana, on the Missouri River. The dam is owned and operated by the Montana Department of Natural Resources and Conservation (DNRC).

The original concrete gravity dam was completed in 1940. It is 40 feet high to the top of the gravity overflow section, and 56 feet high to the top of the retaining wall. The dam is 705 feet wide, with a spillway capacity of 47,000 cubic feet per second (cfs) at the normal operating pool elevation of 3952.6. A powerhouse was constructed on the left (looking downstream) bank of the river through the dam. A 10 megawatt turbine-generator unit was installed in the powerhouse. Power was first generated in July 1989.

Water from the reservoir is used for irrigation. Water is delivered to purchasers through a canal system that is owned by DNRC. The Main Canal is 1.5 miles long and has a capacity of 342 cfs; the West Canal is 12.4 miles long and has a capacity of 90 cfs; and the East Canal is 34.3 miles long and has a capacity of 252 cfs. An 84-inch diameter steel pipe flume, 667 feet long, crosses the Missouri River to the East Canal.

The areas upstream and downstream of the dam are similar. The river is in a narrow, deep valley both upstream and downstream. The hills are fairly steep and rock-covered; an occasional rock outcropping can be seen. The valley broadens out about five miles downstream. The Montana Rail Link railroad follows the river on the right bank (looking downstream). The U.S. Bureau of Reclamation Crow Creek Irrigation pumping plant is located on the left bank (looking downstream) upstream of the dam. The irrigation canal follows the river on the left bank from the dam until it splits into two separate channels at a division structure. A steel pipe flume carries water across the river to a canal on the right bank, and some water remains in a canal that follows the left bank.

A small BLM picnic area is located about one-half (½) mile downstream of the dam on the left bank. Other residences, towns and structures are located far enough downstream to be outside of any potential zone of risk that may result from dam failure or large flood releases resulting from operations of the Broadwater-Missouri Dam. The Flood Inundation Map may be viewed in Appendix VII.

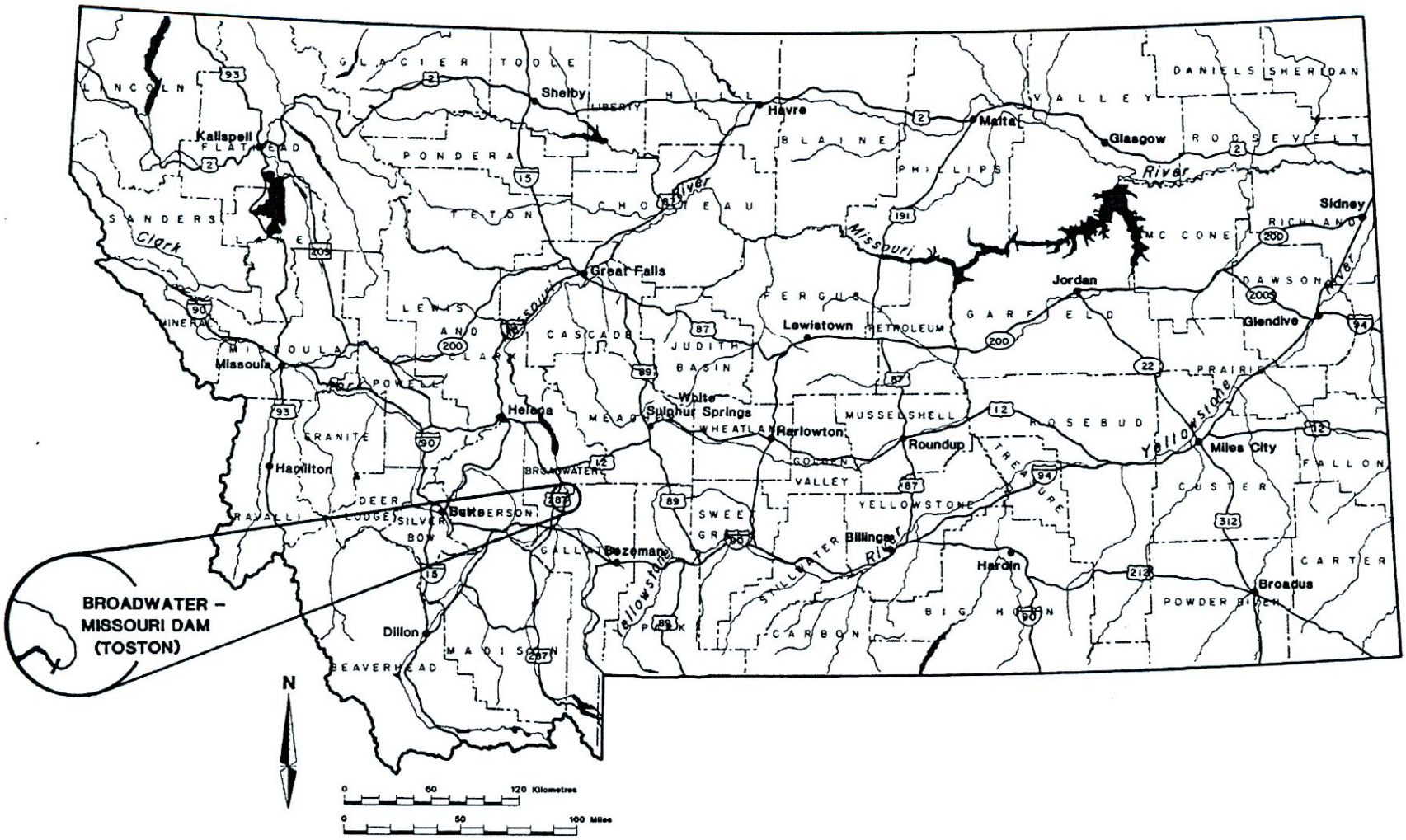


Figure 1. Broadwater-Missouri Dam Location

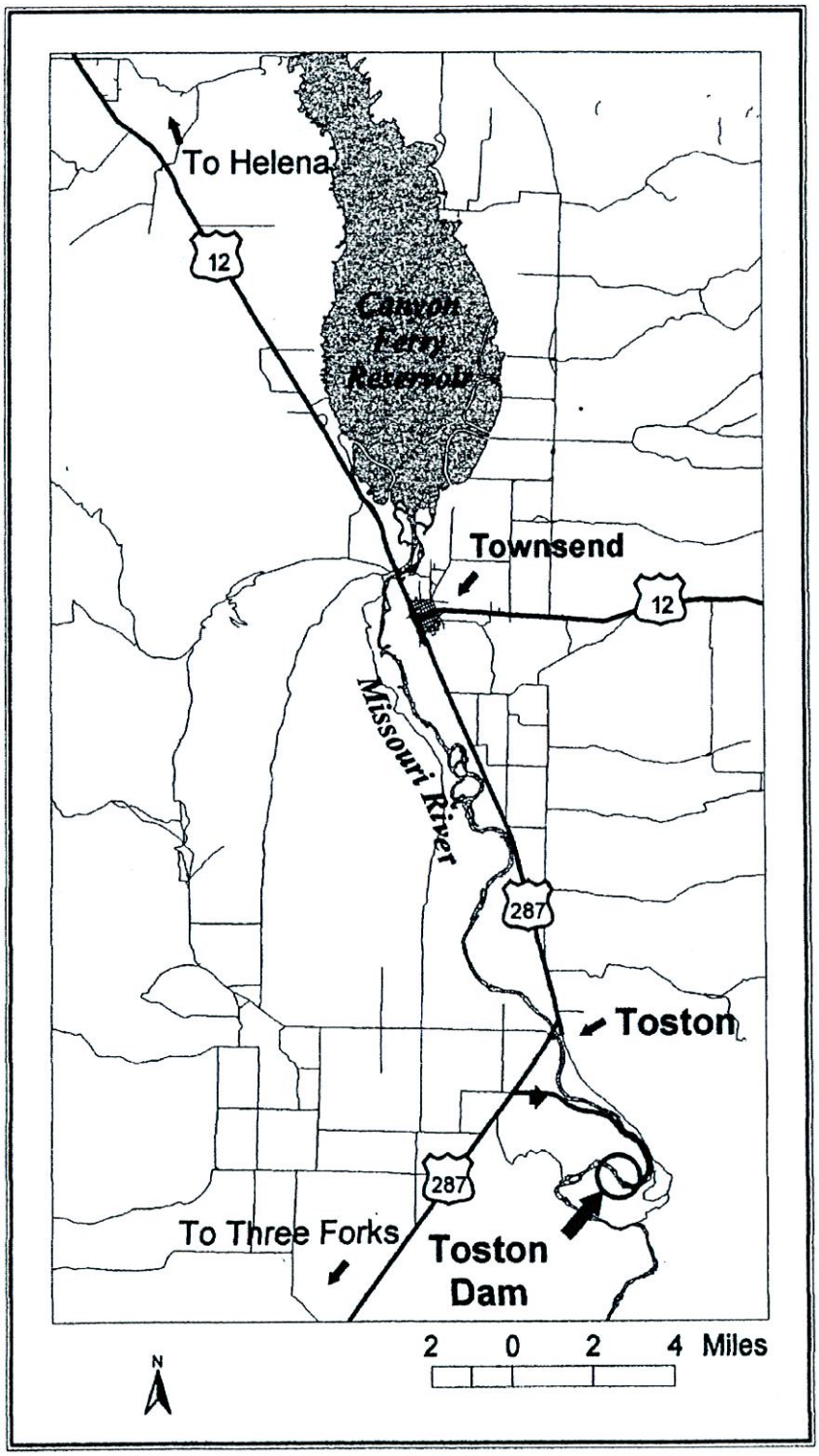


Figure 2. Broadwater-Missouri Dam Access Route

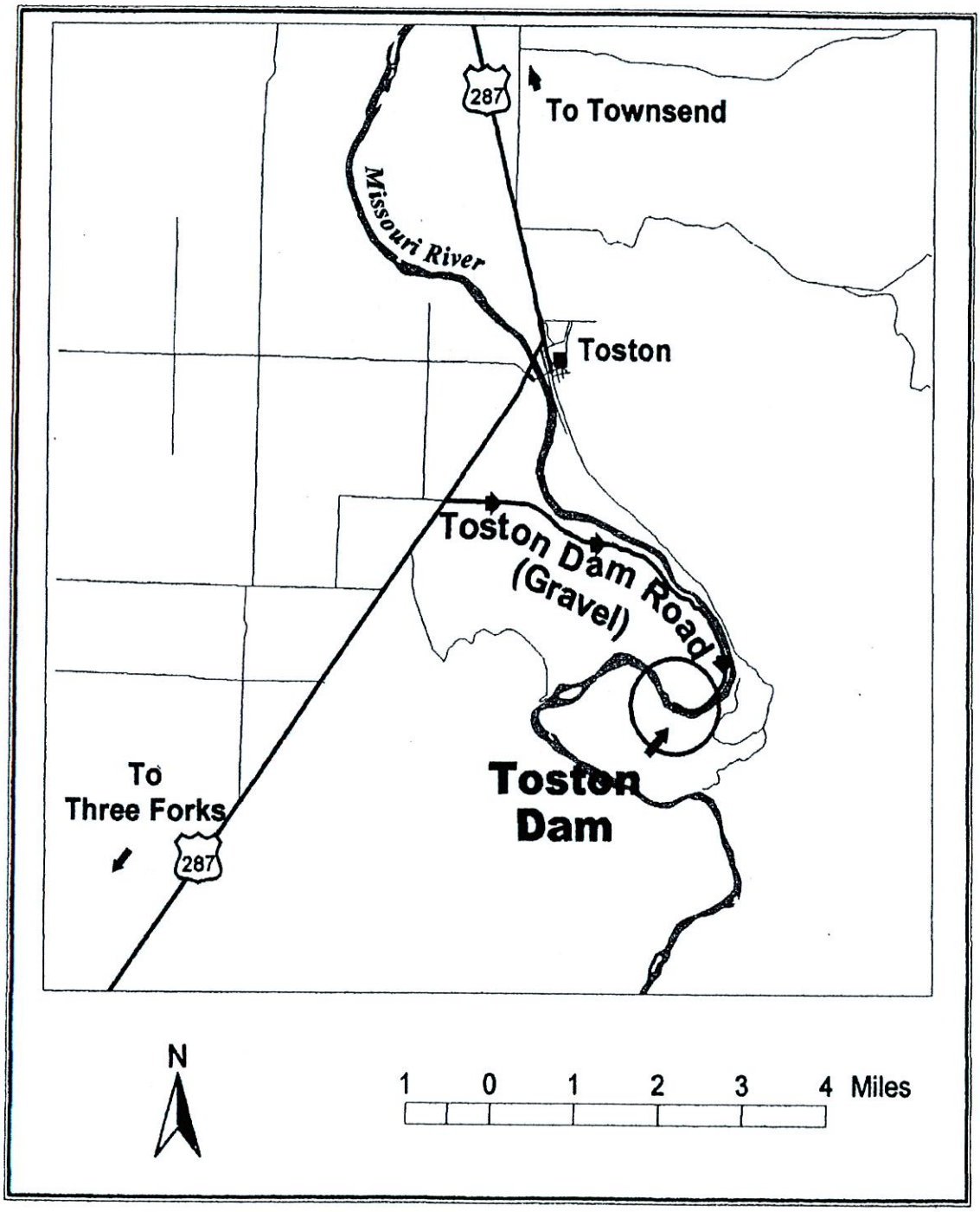


Figure 3. Detailed Access Route to Broadwater-Missouri Dam

IV. Emergency Detection, Evaluation, and Classification

A. Detection

For the purpose of this EAP, detection of two dam failure emergency classifications and one non-failure emergency condition are provided as follows:

1. Attended

During periods when the plant is manned by a Plant Operator, emergency conditions are detected through the normal daily inspection routine consisting of the powerhouse inspection tour, inspection of the dam and spillway structure, and monitoring plant operations such as headwater and tailwater levels through the control room SCADA (Supervisory Control and Data Acquisition System) terminal. The Plant Operator should immediately investigate any unusual changes in plant operating conditions and headwater and tailwater levels while using the control room SCADA terminal.

2. Unattended

During periods when the plant is unattended and operating under the automated PLC (Programmable Logic Controller) control, emergency conditions are detected either through remote monitoring by the on-call Plant Operator, or by the on-call Plant Operator receiving an alarm call from the automated emergency notification system. Upon receiving an alarm call, the on-call Plant Operator either travels directly to the project and investigates the alarm, or accesses a remote SCADA terminal and monitors the plant, whichever is nearest. All Plant Operators possess remote SCADA terminals in their residences. Detection of an emergency condition by remote monitoring is achieved by viewing and evaluating any changes in plant conditions, headwater and tailwater levels, and surveillance camera images.

B. Evaluation and Classification

The two dam failure scenarios and one non-failure scenario for the Broadwater Dam are:

1. Failure is imminent or has occurred (Condition A)

Failure under this scenario either has occurred, is occurring, or obviously is about to occur. Likely causes would be earthquake, extreme flooding, sabotage, etc. No time is available for inspection by a qualified engineer or implementation of mitigation measures.

When "Failure is imminent or has occurred" has been determined, then Flowchart A is implemented by plant operating personnel to notify emergency response agencies.

2. **Potential failure situation is developing (Condition B)**

This situation allows time for inspection, monitoring, and evaluation by a qualified engineer. There is time available to implement necessary corrective and/or mitigative measures. The situation may be caused by slowly rising flood levels, evidence of piping, earthquakes causing minor damage, instrumentation failure, etc.

When a "Potential failure situation is developing" has been determined, then Flowchart B is implemented by plant operating personnel to notify emergency response agencies.

3. **Non-failure emergency (Condition C)**

Non-failure emergency conditions are more common than the failure emergency conditions and are the most likely reason for using an EAP. Generally, this situation should be used when there is no danger of dam failure, but flow conditions are such that flooding is expected to occur downstream of the dam. Use of the EAP can provide an early warning to downstream areas during flood conditions or large spillway releases. The flood level for the Missouri River at the Broadwater Dam is defined by the National Weather Service to be a flow level that exceeds a gage height of 10.5 feet at USGS Streamgage 06054500 equating to roughly 25,000 cubic feet per second either naturally, or with the addition of unusual spillway gate releases at the Broadwater Dam.

When a "non-failure emergency" condition exists then Flowchart C is implemented to the extent that DNRC officials decide is appropriate.

V. General Responsibilities Under the EAP

A. Licensee's Responsibility

It is the responsibility of plant operating personnel to respond quickly to emergency conditions and correctly determine if either one of the three conditions described in this manual apply to the situation. If one or the other does apply, the plant operating personnel must immediately implement the appropriate notification and operating procedures described below and outlined in Flowcharts A, B, and C in Section I.

The notification flowcharts in Section I identify the agencies and people to be contacted during an actual or developing dam failure. The notification procedure to implement at Broadwater Dam is dependent upon whether the dam is attended or unattended and which Flowchart is initiated.

1. Attended

If a **"failure is imminent or has occurred"** condition is confirmed and the control room is attended, then the Plant Operator's first responsibility will be to notify the Broadwater County Sheriff. The Plant Operator shall then notify the Plant Superintendent by telephone. The Plant Superintendent's primary responsibility, upon receiving notification from the Plant Operator, is to notify the Project Supervisor.

If you cannot reach the person that is next on the call down list, then you must assume their duties and responsibilities.

The Plant Operator shall then secure the power plant and transmission line as is appropriate and if time and safety concerns allow, notify recreationists in the upper and lower picnic areas of the emergency condition and advise them to evacuate to higher ground.

If a **"potential failure situation is developing"** and the control room is attended, then the Plant Operator's first responsibility is to notify the Plant Superintendent. The Plant Superintendent's primary responsibility, upon receiving notification from the Plant Operator, is to notify the Project Supervisor. The Project Supervisor will first notify the SWPB Chief and second, the Broadwater County Sheriff if the developing conditions make the notification of the sheriff necessary.

If a **"non-failure emergency"** is developing and the control room is attended, then the Plant Operator's first responsibility is to notify the Plant Superintendent. The Plant Superintendent's primary responsibility, upon receiving notification from the Plant Operator, is to notify the Project

Supervisor. The Project Supervisor will first notify the SWPB Chief and second, the Broadwater County Sheriff if the developing conditions make the notification of the sheriff necessary.

2. Unattended

When the control room is unattended, then the Plant Operator who is on-call may be alerted of a problem by an alarm. The two types of alarms that signal a warning to the Plant Operator that an EAP response may be warranted are the general plant shutdown alarm and the low reservoir level alarm.

When a general plant shutdown or low reservoir level alarm occurs then the Plant Operator's first responsibility is drive directly to the project or, access one of the remote SCADA terminals, whichever is nearest. If the Plant Operator drives to the project, the procedures for "attended" should be followed. If the Plant Operator accesses a remote SCADA terminal, the remote SCADA will provide camera images of the dam and operating conditions of the power plant. The Plant Operator will review the camera images, recent trends in tailwater and headwater, and recent trends in rubber gate pressures to determine if a dam-failure emergency condition exists. A **"failure is imminent or has occurred"** condition exists if:

1. Structural damage to the dam is apparent in the camera views.
2. Unusual looking flow conditions are apparent in the camera views.
3. The trending screens display rapidly declining headwater level with rapidly rising tailwater since the time of the alarm.
4. The trending screens display dropping gate pressures with blowers activated since the time of the alarm.

The Plant Operator's next responsibility will be to implement Flowchart A by notifying the Broadwater County Sheriff. The Plant Operator shall then notify the Plant Superintendent by telephone. The Plant Superintendent's primary responsibility, upon receiving notification from the Plant Operator, is to notify the Project Supervisor. The remaining contacts under "Flowchart A, Failure is Imminent or Has Occurred" shall be completed.

<u>If you cannot reach the person that is next on the call down list, then you must assume their duties and responsibilities.</u>

If camera images are normal looking, spillway flow appears normal, headwater and tailwater levels and gate pressures are relatively stable since the time of the alarm, then the Plant Operator shall travel to the dam and investigate the cause of shutdown and/or alarm.

When the Plant Operator arrives at the project, he/she will conduct an inspection tour of the dam and powerhouse to evaluate the need for immediate action. If a **"potential failure situation is developing"** then the Plant Operator's first responsibility is to implement Flowchart B by notifying the Plant Superintendent. The Plant Superintendent's primary responsibility, upon receiving notification from the Plant Operator, is to notify the Project Supervisor. The Project Supervisor will first notify the SWPB Chief and second, the Broadwater County Sheriff if the developing conditions make the notification of the sheriff necessary.

Upon arriving at the project, if the Plant Operator determines a **"non-failure emergency"** is developing, then the Plant Operator's first responsibility is to implement Flowchart C by notifying the Plant Superintendent. The Plant Superintendent's primary responsibility, upon receiving notification from the Plant Operator, is to notify the Project Supervisor. The Project Supervisor will first notify the SWPB Chief and second, the Broadwater County Sheriff if the developing conditions make the notification of the sheriff necessary.

When the Plant Operator is on vacation or leave, then the Plant Superintendent assumes the Plant Operator's duties, as well as his/her own duties. When the Plant Superintendent is on vacation or leave, then the Project Supervisor assumes the Plant Superintendent's duties, as well as his/her own duties. When the Project Supervisor is on vacation or leave, then the Plant Superintendent assumes the Project Supervisor's duties, as well as his/her own duties.

The remote SCADA terminals are located in the powerhouse at the dam, in the DNRC office building in Helena, and in the Plant Operators' residences.

3. Communication Examples (attended or unattended)

In times of an emergency, clear and concise exchange of information is essential. The Plant Operator when making the call to the Broadwater County Sheriff for a "failure is imminent or has occurred" scenario, shall include the following points:

- Caller's name and position
- Caller's location
- Brief description of situation
- The time of situation
- Intended follow-up actions
- Appropriate Notification Flowchart to initiate

IMPORTANT - ASK THE PERSON RECEIVING YOUR MESSAGE TO REPEAT IT BACK TO YOU SO THAT YOU WILL KNOW THAT THEY RECEIVED THE CORRECT MESSAGE AND UNDERSTAND HOW THEY ARE TO PROCEED.

A typical communication from a Plant Operator to the Broadwater County Sheriff under **"failure is imminent or has occurred"** condition may be as follows: "This is John Doe, operator at Broadwater Dam. The spillway bays are at or near hydraulic capacity and the dam may experience overtopping. The Missouri River flow is 65,000 cfs, therefore initiate Notification Flowchart A. I am evacuating the site."

The Plant Operator when making the notification call to the Plant Superintendent for a **"potential failure situation is developing" or a "non-failure emergency"** shall include the following points:

- Caller's name and position
- Caller's location
- Brief description of the potential problem
- Brief assessment of the potential problem
- Intended follow-up actions
- Appropriate Notification Flowchart to initiate

A typical communication from the Plant Operator to the Plant Superintendent for a **"potential failure situation is developing" or a "non-failure emergency"** may be as follows: "This is John Doe, operator at Broadwater Dam. The rubber gate in Spillway Bay 2 has a severe tear in the rubber fabric. The spillway rubber gates are loosing air pressure and dropping. I am requesting you to initiate notification procedures for a "non-failure emergency". Flows in the Missouri River are about 5,000 cfs, therefore initiate Notification Flowchart C. I will stay on site and monitor the situation."

The Plant Superintendent will report a **"potential failure situation is developing" or a "non-failure emergency"** to the Project Supervisor. The Project Supervisor will contact the SWPB Chief and the Broadwater County Sheriff if the condition warrants. If the SWPB Chief is contacted, he will decide if other SWPB personnel will be contacted for assistance. The SWPB will discuss possible solutions to the problem. These steps will be performed in order to provide assistance to the Plant Operator. However, the Plant Operator monitoring the problem is at liberty to initiate notification for a **"failure is imminent or has occurred"** condition whenever he/she feels it is warranted.

4. **Emergency Operations**

Once the Plant Operator has completed the appropriate notification procedures, then he/she will implement the emergency operation procedures. The Plant Operator during the emergency condition will have to determine whether he/she can safely perform all steps in the operation procedures. The Plant Operator's primary concern is his/her own safety. Outlined below are the emergency operation procedures for both a **"failure is imminent or has occurred"** condition and a **"potential failure situation is developing"** condition.

a. **Failure is imminent or has occurred.**

Step 1 Initiate Flowchart A
Step 2 Evacuate all station personnel
Step 3 Alert all people immediately downstream in the tailrace area to evacuate to higher ground (use bullhorn).
Step 4 Alert all people located above the dam to exit the reservoir (use bullhorn).
Step 5 Shut down the unit using emergency procedures.
Step 6 Operate spillway gates to mitigate downstream flooding.
Step 7 Evacuate the people along the river downstream of the dam to the lower BLM picnic area.

Note: Steps 5, 6, and 7 should be initiated only if they can be completed without endangering the life of the Plant Operator.

b. **Potential failure situation is developing.**

(The following steps shall be initiated only at the direction of the Plant Superintendent or the Project Supervisor).

Step 1 Initiate Flowchart B
Step 2 Evacuate all nonessential personnel including boaters and fishermen.
Step 3 Shut down unit using normal procedures.
Step 4 Operate spillway gates to mitigate downstream flooding.
Step 5 Evacuate people along the river downstream of the dam to the lower BLM picnic area.

c. Non-failure emergency

Step 1 Initiate Flowchart C

There are no other emergency operations for this scenario.

B. Responsibility for Notification (Attended or Unattended)

1. Failure is Imminent or Has Occurred

Plant Operator's notification responsibilities for a **"failure is imminent or has occurred"** condition.

a. Notify the Broadwater County Sheriff and advise him/her of the situation by telephone:
Sheriff Dispatch Center 406-266-3441 (24 hrs)

b. Notify the Plant Superintendent and advise him/her of the situation by telephone:

Plant Superintendent		
Mike Sims	Office	406-444-6772
	Home	406-449-3774
	Cellular	406-439-9876

Note: If the Plant Operator cannot notify the Plant Superintendent, then the Plant Operator is responsible for the Plant Superintendent's notification calls in addition to notifying people located near the project with a bullhorn.

Plant Superintendent's notification responsibilities for a **"failure is imminent or has occurred"** condition. Notify the Project Supervisor and advise him/her of the situation by telephone:

Project Supervisor		
Walt Anderson	Office	406-444-6659
	Home	406-443-3016
	Cellular	406-431-0540

The Project Supervisor's notification responsibilities for a **"failure is imminent or has occurred"** condition.

a. State Water Projects Bureau Chief

Kevin Smith	Office	406-444-2932
	Home/Cellular	406-461-6275

b. Federal Energy Regulatory Commission

Edward Perez	Office	503-552-2750
	Home	503-285-1381
	Cellular	503-706-8237
Patrick Regan	Office	503-552-2700
	Home	503-292-1915
	Cellular	503-706-8733

c. Water Users Association

Rod Kitto, President	Home	406-266-3559

The Broadwater County Sheriff's notification responsibilities for a **"failure is imminent or has occurred"** condition.

Broadwater County DES

Bill Fleiner	24 Hr.	406-266-3441
	Cellular	406-980-2053
	Office	406-266-9250

State Water Project Bureau Chief's notification responsibilities for a **"failure is imminent or has occurred"** condition, day or night.

a. National Weather Service (Great Falls) 406-453-2081 (24 hrs) or 406-453-4561 (24 hrs) or 406-727-7671 (24 hrs)

b. Canyon Ferry Power Plant Operator (Casper, Wyoming) 307-261-5670 (24 hrs)

2. Potential Failure Situation is Developing

Plant Operator's notification responsibilities for a **"potential failure situation is developing"** condition.

a. Notify Plant Superintendent and advise him/her of the situation by telephone:

Plant Superintendent

Mike Sims	Office	406-444-6772
	Home	406-449-3774
	Cellular	406-439-9876

Plant Superintendent's notification responsibilities for a "potential failure situation is developing" condition.

a. Notify Project Supervisor and advise him/her of the situation by telephone:

Project Supervisor

Walt Anderson	Office	406-444-6659
	Home	406-443-3016
	Cellular	406-431-0540

The Project Supervisor will report the situation to Chief, SWPB. Depending upon the nature of the potential failure situation, mitigation measures will be discussed with the SWPB before a specific course of action is chosen. If deemed necessary, the Project Supervisor will notify the following:

a. State Water Projects Bureau
Kevin Smith — Office 406-444-2932
Home/Cellular 406-461-6275

b. Broadwater County Sheriff 406-266-3441 (24 hrs)

c. National Weather Service
Great Falls Office 406-453-2081
406-453-4561

d. Federal Energy Regulatory Commission
Edward Perez — Office 503-552-2750
Home 503-285-1381
Cellular 503-706-8237
Patrick Regan — Office 503-552-2700
Home 503-292-1915
Cellular 503-706-8733

e. . Water Users
Rod Kitto, President — Home 406-266-3559

3. **Non-failure emergency**

Plant Operator's notification responsibilities for a **"non-failure emergency"** condition.

a. Notify Plant Superintendent and advise him/her of the situation by telephone:
Plant Superintendent
Mike Sims — Office 406-444-6772
Home 406-449-3774
Cellular 406-439-9876

Plant Superintendent's notification responsibilities for a "non-failure emergency" condition.

a. Notify Project Supervisor and advise him/her of the situation by telephone:
Project Supervisor
Walt Anderson — Office 406-444-6659
Home 406-443-3016
Cellular 406-431-0540

The Project Supervisor notification responsibilities for a **"non-failure emergency"** condition.

a. State Water Projects Bureau
Kevin Smith — Office 406-444-2932
Home/Cellular 406-461-6275

Depending upon the nature of the non-failure emergency condition, mitigation measures will be discussed with the SWPB before a specific course of action is chosen. If deemed necessary, the Project Supervisor will notify the following:

a. Broadwater County Sheriff 406-266-3441 (24 hrs)

b. National Weather Service 406-453-2081
406-453-4561

C. Responsibility for Evacuation

Warning and evacuation planning are the responsibilities of local authorities who have the statutory obligation. Primarily, the Broadwater County Sheriff and the local DES County Coordinator are responsible for evacuation procedures. Plant operating personnel should not usurp or interfere with these agencies as they implement their responsibilities. However, under certain conditions when local authorities cannot respond in time, plant operating personnel may need to notify people around the dam and along the river downstream to the lower BLM picnic area that they should evacuate to higher ground. The Plant Operator shall be responsible for warning those recreating in the reservoir or downstream of the dam to the lower BLM picnic area of a **"failure is imminent or has occurred"** condition. The Plant Operator when evacuating the site shall position himself along the road and use a bullhorn to warn recreationists. The warning must clearly express dam failure is imminent and evacuation from the Missouri River must begin immediately.

The Broadwater County Sheriff will coordinate evacuation, rescue and mitigation of all parties affected by a Broadwater Dam failure. The Broadwater County Sheriff is responsible for coordinating these activities within his/her jurisdiction. The responsibilities of the Broadwater County Sheriff in times of a dam failure are outlined in the "Emergency Operation Plan for Broadwater County and City of Townsend" in the section titled "Dam Failure/Flood, Contingency Plan."

In a county-wide disaster, the County officials will establish an Emergency Operations Center (EOC). DNRC officials should establish communications with the EOC and provide a Department liaison at the EOC to coordinate the

Department's communications. The location of the EOC and its phone number(s) is not currently known but will be established through the County Sheriff and DES coordinators during the emergency preparations.

D. Responsibility for Termination and Follow-up

The Project Supervisor is required to notify the local agencies when initiating notification procedures for both, "failure is imminent or has occurred" or "potential failure situation is developing" conditions. Local officials and the media will be updated by the Project Supervisor of changes in the condition of the dam, including when the emergency condition has terminated.

Following termination of the emergency condition, the Project Supervisor shall use all expertise and means available to investigate the situation and write a follow-up report.

E. EAP Coordinator

The EAP Coordinator is Walt Anderson, Project Supervisor. Some activities Mr. Anderson will coordinate are revisions to the EAP, training seminars for plant operators, and annual testing of the EAP. Mr. Anderson's office address is: 1424 9th Ave, Helena, Montana 59620-1601 and he can be reached at 406-444-6659.

VI. Preparedness

A. Surveillance

1. Surveillance When Attended

The Broadwater Dam is monitored by a Plant Operator six hours a day and by a Supervisory Control and Data Acquisition (SCADA) system and surveillance cameras twenty-four hours a day. The SCADA system and real-time camera images are available via an internet connection.

Surveillance of the dam will be performed principally by the Plant Operator. The Plant Operator will be the primary observer; other persons may report problems with the dam when they are in the area. The duties will include observation of dam safety related checklist items including seepage, cracks, settlement, debris, erosion, etc. The ditch rider is normally at the dam once a day during the irrigation season, but not year-round, and may observe and report problems.

The SWPB conducts weekly physical inspections of the dam. The dam is equipped with post tensioning anchor system monitors, piezometers adjacent to the powerhouse, and a headwater/tailwater level monitoring system with trending. An inspection report is written and compared to previous inspection reports.

The Plant Operator is trained annually on inspection procedures. The Plant Operator learns to identify any unusual sound, smell, vibration or heat source around the plant. The Plant Operator is also trained to monitor the general condition of the project structures and power house equipment. The various items that are inspected daily by the Plant Operator are listed below:

Daily Inspection:

1. Substation
    a. Make a general switchyard inspection.
    b. Make a general transformer and breaker inspection.

2. Dam waterways and spillway gates
    a. Inspect all spillway gates.
    b. Inspect piers, right and left abutments for leaks or cracks.
    c. Inspect trash rack at turbine intake.
    d. Check headwater staff and compare with plant meters.
    e. Check for icing conditions of all waterways upstream and downstream.
    f. Check all boater safety booms and associated safety equipment.

3. Powerhouse
    a. Make a general inspection of all mechanical components.
    b. Check SCADA for alarms and investigate.
    c. Check and record critical temperatures, water levels, and outputs from SCADA.
    d. Check all fluid levels, flow levels, and pressures.
    e. Check all pumps, motors, pressure vessels and compressors.
    f. Check for leaks and general condition of all: lubricating oil system, hydraulic system, cooling water system, and seal water system.
    g. Check battery room charger and batteries.
    h. Check general operating condition of the automatic upstream head level control.

2. Surveillance When Unattended

The Broadwater powerhouse and appurtenances are continuously monitored by a Supervisory Control and Data Acquisition (SCADA) system and surveillance cameras. The SCADA system and real-time camera images are accessible from a remote location using a computer with an internet connection. The SCADA system consists of the following components: sensor devices located throughout the powerhouse and dam facility, connecting electrical hard-wire system, communications input/output programmable logic controller (PLC), powerhouse computer and monitor (SCADA terminal), and remote SCADA terminals. The SCADA provides real-time information on power plant operating conditions and historical time-based information such as headwater and tailwater levels. The SCADA system signals a plant shutdown or alarm condition and activates the emergency notification system which in turn contacts plant operating personnel in order of priority, beginning with the Plant Operator who is on-call. Upon receiving an emergency notice, the Plant Operator either drives directly to the project in which case the "Attended" procedures are implemented; or the Plant Operator accesses a remote SCADA terminal, whichever is nearest. Remote SCADA terminals are located in the DNRC office building and the residences of all Plant Operators.

If the Plant Operator accesses a remote SCADA terminal, the remote SCADA will provide camera images of the dam and operating conditions of the power plant. The Plant Operator will review the camera images, recent trends in tailwater and headwater, and recent trends in rubber gate pressures to determine if a dam-failure emergency condition exists. A **"failure is imminent or has occurred"** condition exists if:

1. Structural damage to the dam is apparent in the camera views.

2. Unusual looking flow conditions are apparent in the camera views.
3. The trending screens display rapidly declining headwater level with rapidly rising tailwater since the time of the alarm.
4. The trending screens display dropping gate pressures with blowers activated since the time of the alarm.

B. Response During Periods of Darkness

The instructions to the Operating Personnel are applicable to hours of both daylight and darkness. Procedures for contacting proper personnel and officials are applicable to hours of both daylight and darkness. Until reports can be verified or proven to be false, a warning shall be given in the interest of public safety. There is a telephone at the dam (406-266-3869).

There are two sources of AC power and an invertor DC backup system supplying power to the facility. The spillway bays are air inflated rubber dams which are computer controlled to maintain a constant reservoir level. They can be deflated manually without electrical power. There are overhead lights installed at the dam. A secondary source of power is supplied through a 12KV line from Vigilante Coop that automatically switches into operation if power supply is no longer available through the primary 100KV line supplied by Northwestern Energy.

The procedures for contacting the proper personnel would be the same as those given in sections "Failure is Imminent or Has Occurred" or "Potential Failure Situation Is Developing".

C. Access to Site

The Broadwater Dam is accessed from US Highway 287 over the Toston Dam Road. If the Toston Dam Road becomes inaccessible due to flooding, access to the dam is possible through the town of Toston and following the Lombard Road. A third possibility for accessing the dam exists by following the 100KV transmission line from the switchyard facility. Both the second and third options require a four-wheel drive vehicle. The only other reliable access would be by helicopter.

Access roads to Broadwater Dam and the surrounding area are shown in Section III, Project Description. The Plant Operator is provided a four-wheel drive vehicle, and there are four-wheel drive vehicles available in Helena for personnel leaving from Helena.

D. Response During Weekends and Holidays

At all times, a Plant Operator is on-call. The same procedures for normal response conditions apply to weekends and holidays. Personnel on the notification flowcharts may be impossible to contact. In that case, Plant Operating Personnel should assume the duties of notification for the person who is unavailable.

E. Response During Periods of Adverse Weather

The response time will be longer because of the additional time and travel involved in notification and response to an emergency during adverse weather. Travel time from Toston to Broadwater Dam is about 15 minutes during good weather. During periods of heavy snowfall, the access road to the powerhouse is plowed by the Broadwater County Road Crew when equipment and manpower allows. Otherwise local residents are contacted for emergency plowing.

Instrumentation and surveillance systems are installed on the dam. Even when the dam is unmanned, dam failure would be detected during adverse weather by a low reservoir alarm. If an adverse condition is found, then the notification would follow the procedures in the sections called "Failure is Imminent or Has Occurred" or "Potential Failure Situation Is Developing".

F. Alternative Systems of Communication

Communication for the initial warning will be by telephone or driving directly to the Sheriff's Office. Once the initial warning is given, the Broadwater County Sheriff's Office can use its radio communication system. DES also has a radio communication system. The Sheriff's and DES's systems do not operate on the same frequency, but the two systems could be used concurrently through the sheriff's dispatch operator. All plant operating personnel carry cell phones.

In a county-wide disaster, the County officials will establish an Emergency Operations Center (EOC). DNRC officials should establish communications with the EOC if available, and provide a Department liaison at the EOC to coordinate the Department's communications. The location of the EOC and its phone numbers is not currently known but will be established through the County Sheriff and DES coordinator at the time of the emergency.

G. Emergency Supplies and Resources

1. Stockpiling of material and equipment for emergency use or repairs.

   There are no emergency supplies stockpiled at the site. Sources of equipment for use during an emergency are listed below. We can visualize

no case in which stockpiling materials or use of equipment could reduce the effect of a dam failure. The processes involved in the destruction of a dam are too powerful to be mitigated by the emergency use of machinery or materials. However, the Department will determine if equipment would be useful and will contact the contractors if necessary. The following area contractors have machinery which could be made available in an emergency:

Name	Phone Number
Townsend	
Broadwater County Shop	406-266-3429
MDT Maintenance Shop	406-266-5571
Frank Slifka	406-266-3575
BSE Excavating	406-266-3772
Helena	
Benson Excavation, Inc	406-443-4760
Hall Earth Moving	406-443-2245
Helena Sand & Gravel Co	406-442-1185
Ingram-Clevenger	406-442-5102
MDT Maintenance Shop (Helena)	406-444-6155
Magille & Son	406-442-5283
Maronick Construction Co	406-442-1185
Valley Excavating Sand & Gravel	406-449-4045

2. Coordination of Flows

Broadwater-Missouri Dam is a small run-of-river diversion dam on the Missouri River with little storage capacity. Therefore, runoff forecasts are needed to operate the dam and anticipate any problems that may arise as a result of precipitation and/or snowmelt resulting in high runoff conditions. The Project Supervisor, Walt Anderson, phone (406-444-6659) is responsible for monitoring weather, snowpack, current flow levels, and communicating with the National Weather Service (406-453-2081) to obtain runoff forecasts.

As discussed in paragraph C, the spillway gates are computer controlled to maintain a constant reservoir level. If the headwater level increases above the setpoint by an amount more then allowable, an alarm will be automatically sent to the Plant Operator at a remote location. The Plant Operator can lower the rubber dams manually. A similar alarm is issued if the headwater level drops below a given setpoint and the Plant Operator is required to investigate.

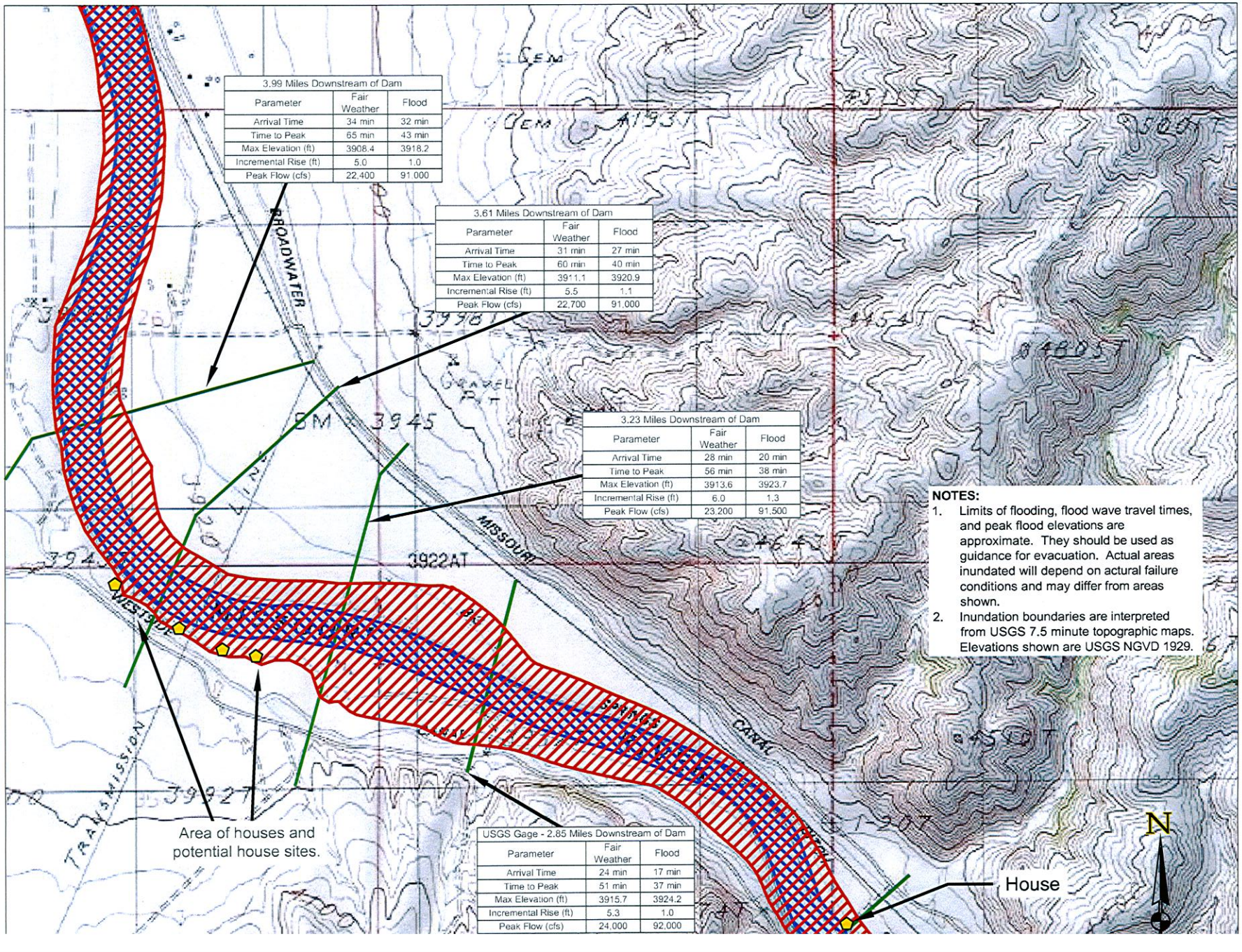
There are some reservoirs upstream of the dam that regulate stream flows.

The dam is an overflow diversion dam; therefore, there is very limited control over the river flows downstream of the dam.

3. **Alternative sources of power for spillway gate operation and other emergency uses.**

The dam normally operates under automatic control by the computer based control system. Primary power is supplied by a 100-kv transmission line connecting to the local utility's grid. A secondary power supply is provided by a 12-kv line from the local rural co-op. Finally, control systems are supplied by a battery bank during emergency conditions with total loss of power and a reserve diesel-powered generator is maintained and tested on a regular basis.

VII. INUNDATION MAPS


3.99 Miles Downstream of Dam
Parameter | Fair Weather | Flood
Arrival Time | 34 min | 32 min
Time to Peak | 65 min | 43 min
Max Elevation (ft) | 3908.4 | 3918.2
Incremental Rise (ft) | 5.0 | 1.0
Peak Flow (cfs) | 22,400 | 91,000
3.61 Miles Downstream of Dam
Parameter | Fair Weather | Flood
Arrival Time | 31 min | 27 min
Time to Peak | 60 min | 40 min
Max Elevation (ft) | 3911.1 | 3920.9
Incremental Rise (ft) | 5.5 | 1.1
Peak Flow (cfs) | 22,700 | 91,000
3.23 Miles Downstream of Dam
Parameter | Fair Weather | Flood
Arrival Time | 28 min | 20 min
Time to Peak | 56 min | 38 min
Max Elevation (ft) | 3913.6 | 3923.7
Incremental Rise (ft) | 6.0 | 1.3
Peak Flow (cfs) | 23,200 | 91,500
USGS Gage - 2.85 Miles Downstream of Dam
Parameter | Fair Weather | Flood
Arrival Time | 24 min | 17 min
Time to Peak | 51 min | 37 min
Max Elevation (ft) | 3915.7 | 3924.2
Incremental Rise (ft) | 5.3 | 1.0
Peak Flow (cfs) | 24,000 | 92,000
NOTES:
1. Limits of flooding, flood wave travel times, and peak flood elevations are approximate. They should be used as guidance for evacuation. Actual areas inundated will depend on actural failure conditions and may differ from areas shown.
2. Inundation boundaries are interpreted from USGS 7.5 minute topographic maps. Elevations shown are USGS NGVD 1929.
Area of houses and potential house sites.
House
N
BROADWATER
MISSOURI
CANAL
TRANSMISSION
WESTSIDE
GRAVEL PIT
BM 3945
3922AT
3992T

VIII. APPENDICES

APPENDIX A
BROADWATER-MISSOURI POWER PROJECT
DAM-BREAK ANALYSIS

APPENDIX A

BROADWATER POWER PROJECT
DAM-BREAK ANALYSIS

Project Description

The Broadwater-Missouri Dam, or Toston Dam, is a concrete gravity overflow dam with ogee spillway located on the Missouri River near Toston, Montana. Original construction of the dam and associated canal system was completed in 1940. The dam has a total length of approximately 705 feet, top of the ogee crest elevation of 3941.6 feet mean sea level and top of dam abutment walls of elevation 3957.6 feet. All elevations presented herein are on the NGVD 1929 datum. The dam is 24 feet high to the top of the gravity overflow section and 40 feet high to the tops of the retaining walls on either end and has an apron that extends 75 feet downstream from the upstream face of the dam. The maximum dam height from the bottom of foundation concrete to the top of the abutments is approximately 50 feet. The reservoir is controlled to elevation 3952.6 feet.

The spillway is located in the center of the dam and has an effective length of 360 feet. The spillway consists of seven bays, each 54 feet wide with air-inflated rubber gates, separated by six reinforced concrete piers, each three feet wide and about 20 feet long. Each of the seven bays has a clear opening width of nominally 51 feet. Atop of each pier is a newly constructed bridge (2006) of steel girders with a reinforced concrete deck and chain link fence. The concrete ogee spillway crest elevation is 3941.6 feet. The crest of the rubber gates, when fully inflated, is at elevation 3953.1 feet. Air bag inflation is regulated within four compressor houses that sit atop the concrete piers, where compressors and release valves inflate and deflate the bags in response to commands received from the powerhouse control system.

The principal outlet structure is the powerhouse. The other regular outlet is the irrigation canal, rated at 342 cfs during the irrigation season. However, the spillway crest elevation and, therefore, the pool elevation, can be regulated by adjusting the turbine wicket gates and the inflation/deflation of seven rubber air bags mounted at the crest of the concrete ogee dam section to release impounded water from the reservoir. The intake structure to the irrigation canal system consists of four steel gates, each four feet wide by seven feet, three inches high.

The powerhouse is a reinforced concrete structure is situated in the left abutment and constructed between 1987 and 1989. The powerhouse is located between the dam itself and the headworks of the Broadwater-Missouri irrigation system. The powerhouse is approximately 160 feet long, with a maximum width of 46 feet and a maximum height above the foundations of about 64 feet.

Method of Analysis

The computer model used to simulate the hypothetical dam failures and to perform the downstream flood routing was the BOSS DAMBRK model. The BOSS model is based on the National Weather Service's Dam-Break Flood Forecasting Model (DAMBRK). This program is generally considered to be the best available model for the downstream routing of dam-break

floods. The DAMBRK model is a one-dimensional, unsteady flow model that includes backwater effects. The primary assumptions in dam breach studies normally include size and shape of the dam breach, time to complete formation of the dam breach, and selection of Manning's "n" (channel roughness) coefficients.

A site visit was performed on January 15, 2008 by John Haapala of MWH. The purpose of the site visit was to review modeled conditions with the actual conditions at the dam, river channel, and potential inundation areas.

Available Data

Cross-sectional information for the Broadwater Dam dam-break study was developed first from cross-sections surveyed by the L.C. Hanson Co. in 1978. This cross-sectional data has the advantage of showing the river bottom profile below the water surface. Additional cross-section data was developed from USGS topographic mapping. A total of 16 cross-sections were input to the dam-break model to represent a distance of 7 miles below the dam.

USGS gaging station 06054500, Missouri River at Toston, is located about 2.75 miles downstream from Broadwater Dam. The rating curve at this gage, in addition to the tailwater rating curve just below the dam, was instrumental in calibrating the roughness coefficients in the dam-break model. By calibration, it was found that the Manning's "n" roughness coefficients for the river varied from about 0.035 at lower flows to 0.030 at higher flows, which are expected values for this river section. Using these roughness values with the cross-sectional data created an excellent dam-break model reproduction of the observed rating curves at the USGS gage and at the dam tailwater and provides a measure of model verification.

USGS gaging station 06054500 provides information on both peak flows and average flow. The average flow at the USGS gage is about 5,000 cfs, which was used as the antecedent flow for the dry weather dam-break case. In the 75 years of peak flow records at the USGS gage, the maximum recorded flow has been 34,000 cfs. The wet weather dam-break simulations used flows of more than double the maximum recorded flow.

The original storage capacity of the reservoir behind Broadwater Dam was approximately 4,100 acre-feet at the normal pool elevation of 3952.6. A bathymetric survey of much of the reservoir area was performed in 2008. Based on the most current data, the current reservoir volume at El 3952.6 was found to be approximately 1,900 acre-feet. The current reservoir volume data was used in the dam-break studies.

Cases and Breach Parameters

Inundation mapping typically requires delineation of both wet weather and dry weather inundated areas because antecedent flow conditions may substantially change the incremental area affected by the dam-break. Breach size and time of formation are also critical parameters.

As summarized in Table A-1, three cases were simulated for preparation of the inundation maps. Case 1 is the dry weather scenario that includes a complete breach of one block of the gravity dam, which was considered to be the appropriate breach size because the dam is post-tensioned and the blocks are not tied together. Case 2 and Case 3 represent hypothetical dam-break events under extreme flood conditions, where the antecedent flow is more than twice the historic recorded maximum flood flow. Case 2 is for a complete failure of one gravity block of the dam

during the inflow design flood with the reservoir water surface at the crest of the dam abutment walls. Because failure of a gravity block would not be expected even during an extreme flood, a more plausible dam failure scenario was simulated as Case 3. If substantial overtopping of the left abutment were to occur, erosion of the embankment could occur, which could ultimately result in failure of the counterfort wall between the powerhouse and the irrigation channel intake, which was simulated as Case 3.

Table A-1: Dam-Break Study Parameters

Parameter	Case 1	Case 2	Case 3
Dam failure mode	One gravity dam block	One gravity dam block	Left abutment overtopping
Breach width	54 feet	54 feet	57 feet
Breach bottom	El 3920	El 3920	El 3930.7
Breach side slopes	Vertical	Vertical	Vertical
Breach formation time	0.25 hours	0.25 hours	0.25 hours
Antecedent flow	5,000 cfs	69,000 cfs	78,000 cfs
Reservoir level at breach initiation	El 3952.6	El 3957.6	El 3959.6

Results

Results of the dam-break studies for each of the three conditions simulated are presented in Tables A-2, A-3, and A-4. The inundation maps were developed for the dry weather condition of Case 1 and the wet weather condition of Case 3, which is a more plausible failure mode than Case 2.

The tables include flow rates and maximum water levels both with and without the hypothetical dam-breaks so that the incremental effects of the dam-break can be determined. The arrival time of the flood wave represents the travel time of the flood wave after it leaves the dam. In a similar manner, the peak elevation travel time represents the travel time from the dam to the indicated cross-section. Ground elevations of structures located at or near the cross-sections are also listed in the tables for reference.

It is emphasized that the flow rates, water levels, and travel times shown in the tables are approximate due to the uncertainties included in many of the assumptions and parameters and the inherent inaccuracies of using a one-dimensional dam-break model to simulate the complex conditions of a dam-break in a river channel. The inundation maps and dam-break results tables should be used as guidelines in preparing emergency responses.

Table A-2

Results - Case 1 - Gravity Dam Block Failure During Fair Weather Conditions

Distance Below Broadwater Dam (mi.)	Without Dam-Break		With Dam-Break		Incremental Effects		Arrival Time (2`) (hr:min)	Peak El Time (2) (hr:min)	Critical Elevation (feet)	Description of Structures near Cross-section
	Peak El (feet) (1)	Peak Q (cfs)	Peak El (feet) (1)	Peak Q (cfs)	Peak El (feet)	Peak Q (cfs)				
0.00	3952.6	5,000	3952.6	30,496	0.0	25,496	0:00	0:00		Broadwater Dam
0.04	3929.4	5,000	3936.6	30,496	7.2	25,496	0:03	0:18		
0.06	3929.3	5,000	3936.3	30,309	7.0	25,309	0:04	0:18		
0.19	3928.8	5,000	3935.4	29,082	6.6	24,082	0:04	0:21		
0.55	3927.0	5,000	3933.3	27,245	6.4	22,245	0:07	0:27	3938.76	Picnic area
1.02	3924.0	5,000	3930.6	25,579	6.7	20,579	0:10	0:31		
1.56	3921.0	5,000	3926.7	25,090	5.8	20,090	0:15	0:33		
2.01	3918.0	5,000	3922.9	24,870	4.9	19,870	0:18	0:38	3930.12	House closest to dam (Marney Johnson house)
2.54	3912.0	5,000	3917.8	24,340	5.7	19,340	0:22	0:46		
2.85	3910.3	5,000	3915.7	24,017	5.3	19,017	0:24	0:51		USGS gaging station
3.23	3907.6	5,000	3913.6	23,232	6.0	18,232	0:28	0:56	3923.51	3 houses downstream from this cross-section
3.61	3905.6	5,000	3911.1	22,678	5.5	17,678	0:31	1:00	3924.10	3 houses upstream from this cross-section
3.99	3903.4	5,000	3908.4	22,410	5.0	17,410	0:34	1:05		
5.05	3897.3	5,000	3901.9	21,294	4.6	16,294	0:45	1:18		Town of Toston
5.99	3891.8	5,000	3895.8	20,465	4.0	15,465	0:56	1:34		
7.00	3886.8	5,000	3890.6	19,130	3.8	14,130	1:09	1:47		

Notes

(1) Elevations are approximate and should be used only as a guideline for establishing inundation areas. Elevations are on NGVD 29 datum.

(2) Travel times are approximate and should be used only as a guideline for evacuation response times.

Table A-3

Results - Case 2 - Gravity Dam Block Failure During Wet Weather Conditions

Distance Below Broadwater Dam (mi.)	Without Dam-Break		With Dam-Break		Incremental Effects		Arrival Time (2) (hr:min)	Peak El Time (2) (hr:min)	Critical Elevation (feet)	Description of Structures near Cross-section
	Peak El (feet) (1)	Peak Q (cfs)	Peak El (feet) (1)	Peak Q (cfs)	Peak El (feet)	Peak Q (cfs)				
0.00	3957.6	69,000	3957.6	95,971	0.0	26,971	0:00	0:00		Broadwater Dam
0.04	3944.0	69,000	3946.6	95,971	2.5	26,971	0:01	0:01		
0.06	3943.5	69,000	3945.9	95,741	2.4	26,741	0:01	0:03		
0.19	3942.7	69,000	3945.2	95,849	2.5	26,849	0:03	0:03		
0.55	3941.5	69,000	3944.3	92,892	2.8	23,892	0:03	0:03	3938.76	Picnic area
1.02	3938.8	69,000	3941.4	89,296	2.6	20,296	0:04	0:03		
1.56	3932.6	69,000	3934.1	89,036	1.5	20,036	0:07	0:08		
2.01	3929.6	69,000	3931.7	88,445	2.2	19,445	0:09	0:10	3930.12	House closest to dam (Marney Johnson house)
2.54	3925.2	69,000	3927.2	87,876	2.0	18,876	0:12	0:13		
2.85	3922.3	69,000	3923.8	87,618	1.5	18,618	0:16	0:20		USGS gaging station
3.23	3921.3	69,000	3923.1	86,832	1.8	17,832	0:18	0:21	3923.51	3 houses downstream from this cross-section
3.61	3918.8	69,000	3920.3	86,244	1.5	17,244	0:21	0:24	3924.10	3 houses upstream from this cross-section
3.99	3915.9	69,000	3917.3	85,897	1.4	16,897	0:24	0:26		
5.05	3908.6	69,000	3909.8	84,780	1.2	15,780	0:34	0:43		Town of Toston
5.99	3904.2	69,000	3905.7	82,374	1.5	13,374	0:44	0:59		
7.00	3902.4	69,000	3903.5	80,373	1.1	11,373	0:54	1:16		

Notes

(1) Elevations are approximate and should be used only as a guideline for establishing inundation areas. Elevations are on NGVD 29 datum.

(2) Travel times are approximate and should be used only as a guideline for evacuation response times.

(3) In 75 years of record at USGS Gage 06054500, Missouri River at Toston, the peak flow has been 34,000 cfs.

Table A-4

Results - Case 3 - Overtopping Failure of Left Abutment During Wet Weather Conditions

Distance Below Broadwater Dam (mi.)	Without Dam-Break		With Dam-Break		Incremental Effects		Arrival Time (2) (hr:min)	Peak El Time (2) (hr:min)	Critical Elevation (feet)	Description of Structures near Cross-section
	Peak El (feet) (1)	Peak Q (cfs)	Peak El (feet) (1)	Peak Q (cfs)	Peak El (feet)	Peak Q (cfs)				
0.00	3959.6	78,000	3959.6	97,413	0.0	19,413	0:00	0:00		Broadwater Dam
0.04	3945.3	78,000	3947.0	97,413	1.8	19,413	0:00	0:01		
0.06	3944.7	78,000	3946.4	97,285	1.7	19,285	0:01	0:01		
0.19	3944.0	78,000	3945.7	97,369	1.8	19,369	0:01	0:02		
0.55	3942.9	78,000	3944.9	95,253	2.0	17,253	0:02	0:02	3938.76	Picnic area
1.02	3940.0	78,000	3941.9	93,087	1.8	15,087	0:03	0:02		
1.56	3933.4	78,000	3934.4	92,920	1.0	14,920	0:06	0:08		
2.01	3930.7	78,000	3932.2	92,541	1.5	14,541	0:09	0:10	3930.12	House closest to dam (Marney Johnson house)
2.54	3926.3	78,000	3927.7	92,175	1.4	14,175	0:12	0:13		
2.85	3923.3	78,000	3924.2	92,003	1.0	14,003	0:17	0:20		USGS gaging station
3.23	3922.4	78,000	3923.7	91,478	1.3	13,478	0:20	0:20	3923.51	3 houses downstream from this cross-section
3.61	3919.8	78,000	3920.9	91,070	1.1	13,070	0:27	0:23	3924.10	3 houses upstream from this cross-section
3.99	3917.2	78,000	3918.2	90,839	1.0	12,839	0:32	0:26		
5.05	3909.5	78,000	3910.4	89,992	0.9	11,992	0:47	0:45		Town of Toston
5.99	3905.5	78,000	3906.5	88,173	1.1	10,173	1:02	1:02		
7.00	3903.3	78,000	3904.2	86,889	0.9	8,889	1:11	1:08		

Notes

(1) Elevations are approximate and should be used only as a guideline for establishing inundation areas.
Elevations are on NGVD 29 datum.

(2) Travel times are approximate and should be used only as a guideline for evacuation response times.

(3) In 75 years of record at USGS Gage 06054500, Missouri River at Toston, the peak flow has been 34,000 cfs.

APPENDIX B

PLANS FOR TRAINING, EXERCISING, UPDATING, AND POSTING THE EAP

Plans for Training, Exercising, Updating, and Posting the EAP

1. **Annual Training Of Project Operators And Other Responsible Personnel**

   Training will be provided on a yearly basis for all Project Personnel involved with the EAP at the dam. This training will include, but is not limited to:

   a. A general discussion on how to respond properly to an emergency situation.
   b. Procedures to follow throughout an emergency.
   c. Basic communications skills - how and when to use them. Samples of typical communications during implementation of the EAP warning flowchart will be given to all personnel during this training.
   d. The flowcharts will be reviewed for each failure scenario.

   This training will be held once every 12 months at a time and date to be determined by the EAP coordinator and will be held in conjunction with the annual review of the EAP.

2. **Exercising and Updating.**

   A comprehensive review of the adequacy of the EAP will be conducted each year. This review is to verify phone numbers, names, position titles, etc. A determination of any new developments or other changes downstream or elsewhere will be made to determine whether any revisions to the current EAP are necessary. Revisions will be made to the current EAP as necessary. Revisions will be made immediately after any changes are discovered and updated pages will be mailed to all holders of the EAP. A statement will be furnished to the Regional Director prior to January 30, which states that the EAP has been thoroughly reviewed and includes the date it was last tested. Attached to this statement will be any updated pages, or a separate statement that no revisions or updates were needed.

   The SWPB will conduct an annual test of the Broadwater EAP. The Plant Operator will initiate the test from the powerhouse control room by calling the first person on the selected flowchart and relaying a test message. The message will inform the person that this is a test of the Broadwater EAP and to follow the selected flowchart, normally Flowchart A, and to verify phone numbers and names. The test will stop once the call has been received by all the agencies and personnel listed on the appropriate flowchart.

   If the test indicates that the EAP needs revision, the EAP will be revised by the SWPB when the yearly revision is completed.

   The SWPB will review and evaluate the test results following consultation with plant and DES personnel. The SWPB will determine if the test is successful based upon recommendations received from the local and state DES personnel.

   The SWPB will submit the test results to the Regional Director of FERC within 30 days of the test.

   The following checkpoints will be used to help determine if the test is successful according to FERC requirements.

   1. Time plant operator initiates the test from the facility dam.
   2. Time it takes project operator to make first call, and any subsequent calls to the other personnel listed on the Notification Flowcharts.
   3. How the message was received by all parties.

3. Posting The EAP

A copy of the notification flowcharts for both a **"failure is imminent or has occurred"** and a **"potential failure situation is developing"** scenarios shall be posted at the following locations:

1. Broadwater Power Project Control Room
2. State Water Projects Bureau Office - Helena
3. Plant Operator's Home
4. Broadwater County DES Coordinator - Townsend
5. Broadwater County Sheriff's Office - Townsend
6. Federal Energy Regulatory Commission - Portland Office
7. State Disaster and Emergency Services – Helena

APPENDIX C

SITE SPECIFIC CONCERNS

(Standard Operating Procedures During Flood Events)

For flood events, the Broadwater Operations and Maintenance Staff will implement the following procedures to reduce the risk to the general public and to mitigate possible damage to the dam and power generating facility:

Broadwater Power Project
Standard Operating Procedures for Flood Events

1. A flood event is defined as any period of time during which the Missouri River gage height, as measured at USGS Streamgage #06054500 exceeds the National Weather Service flood stage of 10.5 feet which equates to a flow rate of roughly 25,000 cubic feet per second (cfs).

2. During flood events of 25,000 cfs or greater, power plant operating personnel are instructed to use frequent visual monitoring of the project via internet video surveillance websites when not actually occupying the facility. Frequent and longer physical occupation times of the power plant facility by plant operating personnel are advised.

3. During flood events of 25,000 cfs or greater, power plant operating personnel are instructed to implement Flowchart C of the EAP whenever unusual spillway gate operations result in unexpected releases of storage water.

4. During flood events of 25,000 cfs or greater, power plant operating personnel shall periodically record video of the river's upstream trash condition, spillway flow condition, and tailrace turbulence.

5. Following a spring runoff season during which the peak daily flow exceeded 25,000 cfs, plant operating personnel are instructed to conduct underwater inspections of the downstream structure of the dam. Specifically, the inspection divers should locate, measure, and record areas of suspected scour at the downstream cutoff wall of the concrete apron.

6. An extreme flood event is defined as any period of time during which the Missouri River stream flow as measured at USGS Streamgage #06054500 exceeds 34,000 cfs.

7. During extreme flood events of 34,000 cfs or greater, power plant operating personnel are instructed to occupy and monitor the facility on a 24-hour basis. Operating personnel shall monitor weather and upstream flow conditions and conduct frequent inspections of the spillway bays and downstream rip rap during their work shift.

8. During extreme flood events of 34,000 cfs or greater, power plant operating personnel are instructed to close the Lower Toston Dam Picnic Area to all public use and erect closure signs. The BLM - Butte Field Office shall be notified of the closure.

9. Plant operating personnel shall exercise their duties in compliance with the Emergency Action Plan should an emergency condition develop, and maintain their own personal safety as a highest priority.

Effective date is 10/19/2009

APPENDIX D
DOCUMENTATION

BROADWATER-MISSOURI DAM
2010 EAP DISTRIBUTION LIST
January 2010

Organization	Name	Title	No. of Copies	Participated in Annual Orientation	Participated in Annual Exercise
DNRC	Walt Anderson	Project Supervisor	2	Yes	Yes
DNRC	Mike Sims	Plant Superintendent	2	Yes	Yes
DNRC	Brian Carroll	Plant Operator	4	Yes	Yes
DNRC	Jim Beck	Plant Operator	2	Yes	No
DNRC	Kevin Smith	SWP Bureau Chief	2	No	No
DNRC	Rob Kingery	Section Supervisor	2	No	No
DNRC	Brandon Watne				
DNRC	Brian Holling	Dam Safety Engineer	2	No	No
DNRC	Dolores Eustice	Administrative Support	1	No	No
DNRC	John Grassy	Information Specialist	1	No	No
DNRC	Laurence Siroky	Water Op Bureau Chief	1	No	No
Broadwater County	Brenda Ludwig	Co. Sheriff	2	Yes	Yes
	Bill Fleiner	Co. DES Coordinator	2	Yes	Yes
State DES	Steve Knecht	State DES Coordinator	2	No	Yes
FERC	Patrick Regan	Regional Director	3	No	Yes
Water Users Association	Rob Kitto	Assoc. President	1	No	Yes
National Weather Service			1	No	Yes
Bureau of Reclamation	Wyoming Office		1	No	Yes
	Canyon Ferry		3	No	Yes
	MT Area Office		1	No	No
MT State Library			1	No	No
Extras			2		
Total			38		

BROADWATER MISSOURI DAM
RECORD OF EAP COMMUNICATIONS

Date	Communcation
9/24/2008	On this date, DNRC conducted a tabletop exercise of the Broadwater-Missouri (Toston) Dam EAP. All emergency response agencies were represented and participated in the exercise. The EAP was thoroughly reviewed and discussed by all participants. A report on the exercise was filed with FERC-PRO on October 22, 2009.
1/11/2010	On this date the Project Supervisor (EAP Coordinator) met with the Broadwater County Sheriff and Undersheriff and reviewed critical elements of the Broadwater (Toston) Dam EAP.
1/14/2011	Telephone discussion between the Project Supervisor and the Broadwater County Sheriff regarding EAP Test, EAP update, Section responsibilities during an EAP event, Emergency Operations Center, dam-break analysis and homes at risk, flowcharts. No follow-up questions necessary.
1/14/2011	Telephone discussion between the Project Supervisor and the Broadwater County DES Coordinator regarding EAP Test, EAP update, responsibilities during an EAP event, dam-break analysis and homes at risk, flowcharts. No follow-up questions necessary.

Record of Revisions --- Broadwater-Missouri EAP

Date of Revision	Material Revised
6/1/91	Complete Plan
11/1/91	Revised pages 1, 3, 16, 28, E-2, G-2, G-3
11/20/92	Revised pages 1, 3, 15, E-2, G-2, G-3, G-5, G-6
8/1/93	Revised text in main body of EAP, Appendices A, D, E, G
1/10/95	Revised telephone numbers in text, Appendix D, G
12/5/96	Revised title page, pages 15, 16, 17, 18, 21, 22, Appendix E and G
12/9/97	Revised names and telephone numbers on page 17 and Appendix G, revised Appendix E
12/11/98	Reprinted entire document, updated names and telephone numbers, revised Appendix E, F, G
12/20/99	Revised title page, updated telephone numbers on pages 1, 3, 18, 19, 22, revised Appendix E and G
01/06/2000	Revised complete plan in accordance with the revised Chapter 6, ☐Emergency Action Plans☐
12/21/2000	Revised title page, updated name and telephone number on pages 3, 5, 20, 23, revised Appendix D and F
12/21/2001	Revised title page, updated name and telephone number on pages 3, 5, 19, 20, 23, revised Appendix D and F
2/26/2003	Revised title page, updated name and telephone number on pages 3, 5, 19, 20, 21, 22, 23, revised Appendix D and F
12/16/2003	Revised title page, updated telephone numbers on pages 3, 5, 19, 20, 22, 23, 32, added EOC paragraph on pages 25 and 31, revised Appendix D and F
12/16/2004	Revised title page, updated telephone number for Harry Hall on pages 20 and 23, and revised Appendix D, E and F. Completed FERC mandated 5-year review and reprinted entire EAP.
12/16/2004	Revised title page, updated telephone number for pages 20 and 23, and revised Appendix D, E and F.
2/14/2006	Revised title page, updated telephone numbers on pages 20 and 23, and revised Appendix D, E and F.
2/9/2007	Updated names, phone numbers and text changes throughout the document.
12/30/2007	Updated names, phone numbers and text changes throughout the document
12/30/2008	Updated names, phone numbers and text changes throughout the document. Revised the dam break analysis and mapping of the flood inundation area. Revised the EAP

	in accordance with FERC Chapter 6, Emergency Action Plan.
12/30/2009	Updated names, phone numbers and text changes throughout the document. Revised the dam break analysis and mapping of the flood inundation area. Revised the EAP in accordance with FERC Chapter 6, Emergency Action Plan.
12/30/2010	Updated names and phone numbers with some text changes throughout the document.

APPENDIX E

TELEPHONE DIRECTORY

APPENDIX E
TELEPHONE DIRECTORY

The telephone numbers are listed in order of priority.

1. Sheriff

Broadwater County 406-266-3441

2. Disaster and Emergency Services

Broadwater County ..... Dispatch 406-266-3441
Coordinator, Bill Fleiner ..... Office 406-266-9250
Home 406-266-3409
Cellular 406-980-2053

Montana Disaster and Emergency Services Division (Helena) (24 hr.) 406-841-3911

3. **Montana Department of Natural Resources and Conservation (DNRC)**

Broadwater Power Project (Toston Dam) 406-266-3869
Auxillary Number (FAX) 406-266-4454
Chatter Box 406-266-3817

Hydropower Section: ***(TOSTON DAM)***

Supervisor, Walt Anderson ..... Office 406-444-6659
Home 406-443-3016
Cellular 406-431-0540

Plant Superintendent, Mike Sims ..... Office 406-444-6772
Home 406-449-3774
Cellular 406-439-9876

Plant Operator, Brian Carroll ..... Office 406-266-3869
Home 406-266-4212
Cellular 406-980-1193

Plant Operator, Jim Beck ..... Office 406-444-6695
Home 406-266-3026
Cellular 406-431-9419

State Water Projects Bureau (SWPB) 406-444-6646
Bureau Chief, Kevin Smith ..... Office 406-444-2932
Home 406-461-6275
Cellular 406-461-6275

Project Rehabilitation Section 406-444-6790
Supervisor, Rob Kingery ..... Home 406-442-0506

Dam Safety Engineer, Brian Holling ..... Office 406-444-6692
Cellular 406-461-9270

Civil Engineer, Brian Grant ..... Work Cellular 406-594-0642

Project Engineer, Sanna Yost ..... Home 406-443-2683
Cellular 406-594-2435

Project Engineer, David C. Larson ..... Home 406-458-8142
Cellular 406-431-6781

Water Operations Bureau ..... Office 406-444-6816
Bureau Chief, Laurence Siroky ..... Home 406-442-2806
Cellular 406-431-7475

Dam Safety Section
Supervisor, Michele Lemieux ..... Office 406-444-6613
Cellular 406-439-3572

Water Resources Division 406-444-6601
Administrator, Tim Davis ..... Cell(W)406-438-2550
Cell(P) 406-461-0844

Assistant Administrator, Lorene Harris ..... Home 406-461-2202

Department Director 406-444-2074
Director, Mary Sexton ..... Home 406-466-2079
Cellular 406-590-2751
Blackberry 406-461-6926

Information Specialist, John Grassy 406-444-0465
Cellular 406-431-0718

4. Ditch Rider

Gordon Brug ..... Home 406-266-5798

5. National Weather Service

Great Falls ..... 406-453-2081, 406-453-4561 or 406-727-7671

6. Canyon Ferry Dam

USBR - Casper WY Operation Center ..... 307-261-5670 (24 hrs)
Montana Area Office 406-247-7295
Canyon Ferry Dam Operators 406-475-3310

7. Broadwater-Missouri Water Users Association

President, Rod Kitto 406-266-3559
Vice President, Corey Davis 406-266-3097
Secretary, Charlotte Lewis 406-266-3632
Directors
Rod Kitto 406-266-3559
Cory Davis 406-266-3097
Arden Bruce 406-266-3289

Joel Flynn 406-266-3578
Mark Ehlke 406-266-4121
Jeff Marks 406-266-3567
Tom Helm 406-266-5643

8. Montana Rail Link (emergency) 1-800-338-4750

9. Governor's Office 406-444-3111
Citizen's Advocate 1-800-332-2272

10. Federal Energy Regulatory Commissiion
Portland Regional Office
Edward Perez ..... Office 503-552-2750
Home 503-285-1381
Cellular 503-706-8237

Cellular 503-706-8237
Patrick Regan ..... Office 503-552-2700
Home 503-292-1915
Cellular 503-706-8733

11. Sources of Aircraft
GOVERNMENT AGENCIES
Department of Natural Resources &
Consevation ..... Office 406-444-2074
Fixed-wing, helicopters
Chuck Brenton ..... Office 406-444-0747
Cellular 406-431-0747

Tal Williams, Pilot ..... Office 406-444-4766
Cellular 406-461-5590

Randy Yeager ..... Office 406-444-0780
Cellular 406-459-5580

Hanger (Ed Martin) 406-444-0789
Cellular 406-431-0789

Helena Fire Dispatch 406-444-4242
Statewide Fire Dispatch 406-329-4995

PRIVATE FLYING SERVICES
Billings
Billings Clinic 406-657-4000
1-800-325-1774

Corporate Air 406-247-3131
Or 406-247-3100
Fixed-wing/cargo & passenger

Bozeman

Central Helicopters Inc. 406-586-9185
Mark Duffy ..... Cellular 406-581-9185
Rick Cima ..... Cellular 406-581-7734

Butte
Butte Aviation 406-494-6694
Fixed-wing/ single & twin engine

Helena
Exec Air 406-442-2190
Fixed-wing/single and twin engine
John Maxness 406-459-6265
Dan Norton 406-459-9168

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